OCTAVE
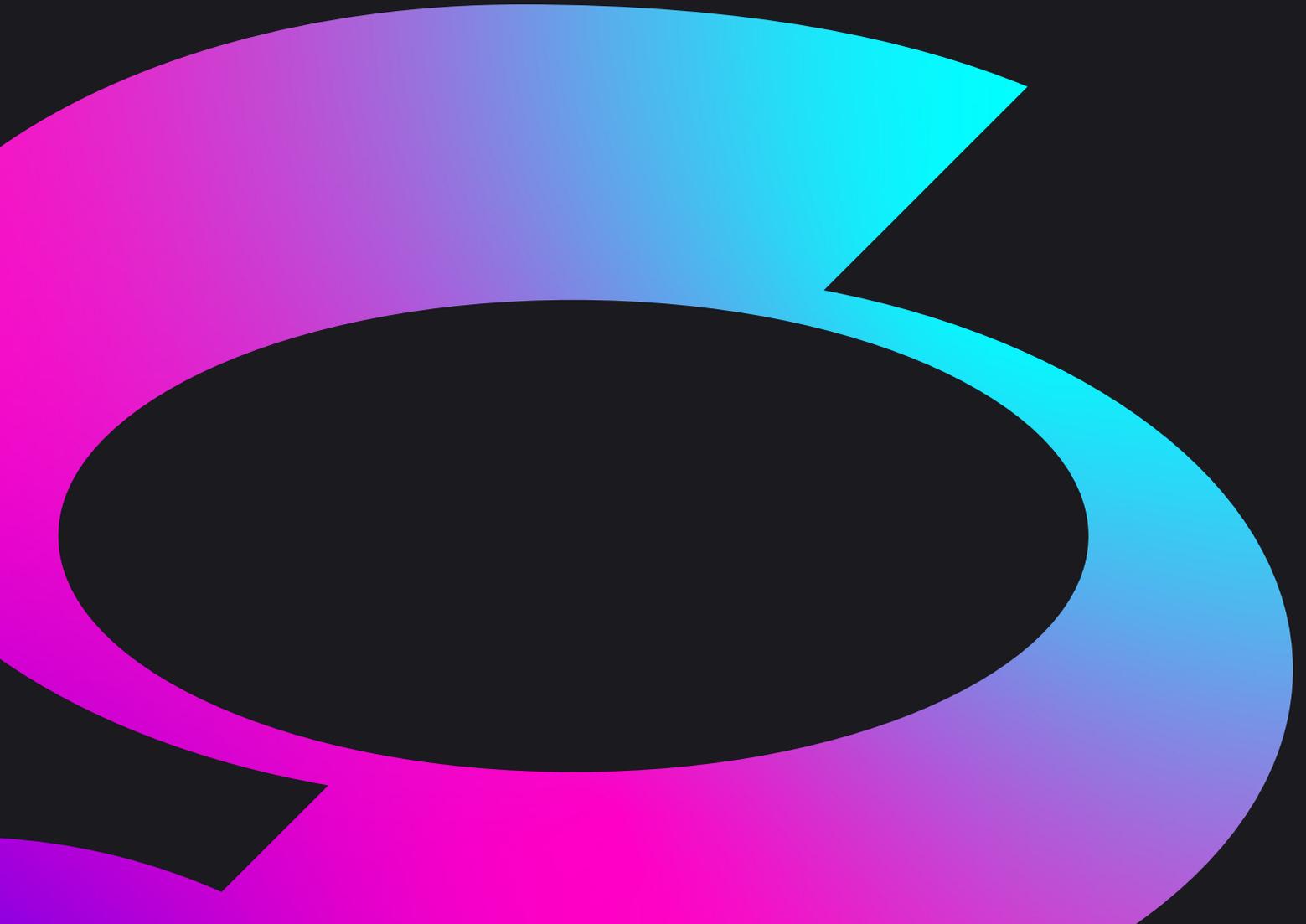
Unlocking the full potential of your mine with Octave

How sustainable mining is possible through accelerated digital technology to maximize operational efficiency, reduce costs and improve safety.

Contents

Introduction

In today's mining industry, maximizing operational efficiency, reducing costs and improving safety are paramount to achieving success. To unlock the full potential of a mine, companies require a comprehensive and integrated approach that addresses all stages of the mining lifecycle. Typically siloed and dispersed over great areas, mining organizations are looking to technology to support new ways of working. More specifically they are looking for technologies that combine engineering, maintenance and operational data with autonomous capabilities to provide a completely integrated and efficient approach from exploration to reclamation of the mines processing assets in a sustainable way. This document investigates how these innovative approaches can improve a mine's triple bottom line.

Exploration

The exploration phase is a critical starting point for any successful mining project. Understanding the orebody drives mine and process planning as well as supporting investment decisions throughout the entire life of the mine. Octave's comprehensive solution offerings help mines understand the orebody and create optimal planning scenarios based on site-specific objectives. Teams can set destination targets, limit haul truck hours, and constrain advancement, all of which can be easily visualized and audited using animated 3D models. A good understanding of the orebody also provides valuable data to plant design teams so that process designs can be optimized for the minerals and metals to be extracted, this in turn supports asset management strategies to significantly reduce maintenance costs whilst ensuring sustainable operations.

The integration of planning, drill and blast, fleet Management and stockyard operations is paramount to achieving maximum efficiencies in safety, quality, efficiency, productivity and sustainability. Through autonomous integration of these key functions, mines can streamline processes, enhance efficiency and reduce operational risks. By effectively tracking the source location and anticipated mineral quality from the block model, grade control model and blast design block information, mines can reduce losses and dilution, improve adherence to operational plans and achieve greater efficiency and optionality within the mining operation. This helps reduce variability in the mineral processing stage and minimize waste in the operations. Innovative solutions for blast movement, fragmentation and slope monitoring provide a continuous feedback loop for safety and productivity. With an emphasis on digital integration, data autonomy and sustainable mining practices, the mining industry can clearly support the transformational shift toward a low-carbon future.

Digital projects

The successful execution of projects, both greenfield and brownfield, is driven by cost and schedule. Yet according to the Construction Industry Institute (CII), since 1965 mining project costs have overrun on average 20%-60% and only 2.5% of projects have been considered successful[1]. This capital expenditure, the creation of a plant, including materials handling components, is specific to each mine and is bespoke in many ways. That said, technologies that leverage common capabilities and improvement processes can increase project performance, reduce cost and drive timeframes to meet the ever-elusive schedule in the extremely iterative project environment. Common collaboration platforms that bring together data sets from across the project, including schematics, project controls and multi-discipline 3D models, support improved discussion and decision-making so teams can be proactive when situations change.

Digital projects: design

To increase project performance, mining organizations must adopt new design processes and methodologies that embrace data and reduce their reliance on documents. With the use of data-centric tools that cover 1D, 2D and 3D or Spatial data, Octave's technologies help drive better designs that are safer and more reliable in operations. They also allow for modularized designs and include specific materials handling capabilities to speed up the design of, for example, conveyor belts through integration to belt design apps like Sidewinder and Helix, removing the need for time-consuming rework. These modular data-centric designs then deliver structural data to fabrication apps such as SDS2 and Tekla for improved fabrication workflows, leading to more accurate finished products that are in line with the initial design intent. Chute plate modelling and parametrized equipment design, speed up layouts and support increased constructability planning, reducing material costs while making construction planning and execution simpler and more streamlined. With a data-centric 3D model in place, organizations can automate drawing production, creating a single source of truth, which removes drawing errors and inconsistencies, ultimately resulting in faster execution in construction and better decision-making in operations. These data-centric approaches to engineering and design support a more visible and controlled project management, from pre-feed to completion, and build a solid foundation of the engineering digital twin that supports the full lifecycle of the mine plant assets it depicts.

Digital projects: execution

The vast majority of the total install cost of a mining plant is attributed to the materials and construction of the asset, making the execution phase of a project the greatest opportunity to reduce cost and affect schedule. By creating a centralized information environment, organizations can enhance collaboration, communication and data management in support of recognized best practices such as advanced work-packaging (AWP) and front-end-planning. AWP, for example, is a recognized best practice of CII that focuses on the improvement of project safety, productivity and predictability through the alignment of engineering, procurement and construction planning, activities, and deliverables.

Unlocking the full potential of your mine octave.com

It has been proven by CII to improve field productivity by up to 25% and reduce total install costs by up to 10%.[2] Thanks to intelligent 3D modelling and visualization capabilities, mining companies can simulate various scenarios and evaluate risks enabling them to optimize the schedule in line with AWP to ensure an on-time startup. A data-centric approach also supports more accurate materials management ensuring materials are available when needed and waste is reduced to a minimum. Additionally, if things don't go to plan, teams have access to information early, allowing them time to proactively reorganize and repurpose people and equipment to more productive tasks. Octave's scalable solutions across materials management, fabrication and construction support all these improvement opportunities, potentially resulting in savings beyond those identified by CII.

This drive for cost reduction and schedule predictability through data also opens new ways of working that help build a more sustainable future. Data, of course, helps us minimize waste thanks to accurate bills of materials and better managed purchasing and distribution of materials. It also helps us identify the most appropriate equipment for the job, taking into account considerations such as warranties and maintenance requirements. In addition, elements such as the carbon footprint and embedded carbon states of materials can be recorded so that organizations can consider the life of mine through new lenses when designing and building the plant that services it.

Handover to operations

Transitioning from the project execution phase to operations can often be challenging resulting in many wasted days and months sifting, sorting and validating documents. Octave's technologies facilitate the seamless handover of data and information from engineering construction and completions teams to operations and maintenance teams.

This early and continuous handover creates new levels of collaboration between engineering and operations that allow operational readiness teams to engage and prepare at the earliest possible time, resulting in operations meeting nameplate production levels far more rapidly than traditional handovers allow. The resultant centralized single source of truth for asset information, accessed via a web interface, allows operations to increase the availability and visibility of the plant design and progress to a much wider audience. This means more teams can have input into the operational ergonomics of the plant, providing optimization opportunities for operations and for maintenance strategies and the streamlining of workflows, which ultimately maximizes the baseline for overall asset performance. Octave enables mining companies to bridge the gap between project teams and operational teams, accelerating startup, and enhancing asset efficiency, while reducing the total install cost and providing schedule assurance.

In the realm of industrial facilities, particularly in the mining sector, efficient operations and maintenance (O&M) practices are paramount to ensure optimal safety, quality, efficiency, productivity and sustainability. The multifaceted nature of mine plant operations brings forth a myriad of challenges that can significantly impact operational performance that ultimately affects the bottom line. With more than 60% of the total mine workforce being almost exclusively focused on servicing or repairing of complex assets in the field,[3] efforts to support them is a top priority. It is with this in mind that Octave provides solutions that maximize the effectiveness of operations and maintenance teams while keeping them safe and increasing overall asset performance, all while we continue to strive for autonomous operations.

Operations and maintenance

Mining operations are complex with many different areas of operations between the pit and the port. The production area itself can often cover kilometers in extreme conditions, making it challenging for the teams in the field. The move to remote operations, including remote-controlled and autonomous transportation, is being increasingly adopted, and this is now starting to diverge into areas of operations and maintenance through drones and robotics. However, there are still many operations environments that use traditional paper and people, particularly where assets are older.

Octave's drive for autonomy is leading the way when it comes to digitalization and digital transformation and the Smart Digital Reality is enabling organizations to leverage their current data and information landscape to drive knowledge and wisdom through all levels of the business from shop floor to top floor, enabling organizations to leverage their current data and information landscape to drive knowledge and wisdom through all levels of the business from shop floor to top floor.

New situational awareness techniques integrate more systems than ever, and over greater distances, keeping people safe and operations running smoothly. Artificial Intelligence (AI) techniques are used to identify changes and anomalies in the field, providing actionable insights for optimization and mitigation where required. Asset management and constraint management capabilities automatically schedule the best teams and equipment for the most important tasks, keeping the asset running harder, for longer. These leading-edge technologies are helping mining companies realize new operational parameters when it comes to the way people work.

While keeping assets running effectively is a key part of operations, optimization and improvement activities are paramount to an organization's competitiveness. Data capture and the maintenance of the virtual plant or the digital twin is a must if teams want to be properly informed when making decisions. With technologies that support the Digital Twin, mining companies can identify bottlenecks, optimize workflows and improve overall productivity, all while ensuring compliance with safety and environmental standards, as they strive for safer, more sustainable operations. Thanks to the connected worker platform that provides teams with the right information at the right time, no matter where they are, teams can plan, act and capture while being guided through the appropriate procedures minimizing human error. Additionally, the data captured feeds back into the Digital Twin enriching and updating it, ensuring its relevancy and providing actionable insights that in turn support insightful actions.

With such a focus on data, organizations are investing billions of dollars in mining infrastructure, and it is critical that actions be taken to protect it from safety and cyber events that create significant negative impact to operations. Having operational risk management and cyber security protection is of paramount importance to prevent these unplanned outages and both elements require an understanding of operations and cyber threats at your lowest level of the Purdue model. Technology is addressing this today, but the threat continues to grow across the IT and OT environments, raising its importance and priority globally.

To this end, Octave technologies are supporting the mining industry to operate safely, while improving quality, efficiency and productivity through sustainable practices. The data produced, maintained and leveraged through a Smart Digital Reality™ makes this possible, it provides actionable insights that drive insightful actions in a secure and trusted environment and through all levels of the business.

Reclamation

The rapid expansion of the mining industry thanks to electrification and other factors has led to heightened concerns regarding its ecological and social consequences. As industries strive for sustainable practices, reclamation has gained prominence as a proactive approach to address the challenges associated with mining-related disturbances. Responsible and sustainable mine closure is therefore an increasingly important aspect of the mining industry. While many mines have many years and decades of life left, investment in smart digital technologies today can revolutionize the way reclamation is approached in the mining industry. The ability to simulate, monitor, and optimize the entire lifecycle of mining and reclamation processes empowers companies to make informed decisions, minimize environmental impacts and ensure long-term sustainability.

Octave's advanced systems assist in the planning of decommissioning and rehabilitation efforts ensuring the sustainability of the environment, ultimately helping companies minimize the environmental footprint of their operations and contribute to these sustainable practices.

Unlocking the full potential of your mine

Conclusion

The mining industry plays a crucial role in providing essential raw materials for various sectors of the global economy. Mines are constantly driving to be more sustainable and have low emissions targets in support of global goals while striving to be more profitable. Initiatives addressing environmental conservation, social responsibility, regulatory compliance and the long-term viability of their mines' operations are leading to new data-driven and autonomous work practices that rely heavily on the latest technology.

Octave offers mining organizations a comprehensive and integrated solution stack to help unlock the full potential of their mines. By leveraging advanced project delivery and execution capabilities, Octave empowers mining companies to build and maintain a Digital Twin of their mining processing plant on budget and within schedule. This, integrated with operational data and information, enables a Smart Digital Reality of the mine that enhances decision-making, streamlines processes and improves overall asset performance, in addition to achieving operational excellence, optimizing productivity, reducing costs and ensuring regulatory compliance for the full life of the mine. Octave's technological capabilities, industrial experience, and partner network are all you need to deliver digital transformation to your business, today and long into the ever-changing future.

About the author

Marcus Haynes is a seasoned digital strategist with extensive experience in driving digital transformation and accelerating business growth through the adoption of digital technologies. He is passionate about helping organizations leverage the latest digital tools and technologies to create innovative solutions that drive measurable business results.

References

1. "CII Best Practices," CII, https://www.construction-institute.org/cii-best-practices

2. "AWP Education Framework," CII, https://www.construction-institute.org/CII/media/Documents/CII-AWP-CBA-Education-Framework.pdf

3. "Implementing Effective Maintenance Strategies for Long Term Production Goals", Mining Digital, https://miningdigital.com/supply-chain-and-operations/implementing-effective-maintenance-strategies-long-term-production-goals

About Octave

Octave is a leader in enterprise software, turning data into decisive action and intelligence into your edge. Our software solves for and simplifies complexity, from the design and build to operations and protection of people, property, and assets– for any scope, at any scale. For decades, we've partnered with customers to sharpen performance, elevate efficiency, and amplify results. From factory floors to entire cities, our solutions are tuned to scale up what's possible from day one onward.

octave.com